

What is claimed is:

- 1) **An abrasive carbon foam produced by the controlled foaming of a blend comprising:**
- A) **from about 90 to about 99% by volume of a particulate coal exhibiting a free swell index of between about 3.5 and about 5.0 and of a small diameter; and**
- B) **from about 1 to about 10% by volume of a carbide precursor.**

- 2) **The abrasive carbon foam of claim 1 wherein said particulate coal exhibits a free swell index of between about 3.75 and about 4.5.**

- 3) **The abrasive carbon foam of claim 1 wherein said carbide precursor comprises a member selected from the group consisting of materials capable of reacting with carbon to form carbides under carbon calcining and graphitizing conditions.**

- 4) **The abrasive carbon foam of claim 3 wherein said carbide precursor is selected from the group consisting of: tungsten, silicon and titanium.**

- 5) **The abrasive carbon foam of claim 3 wherein said carbon precursor powder is of a particle size below about 100 microns.**

- 6) The abrasive carbon foam of claim 3 which is a semi-crystalline, largely isotropic, porous coal-based product having a density of between about 0.1 and about 0.8 g/cm₃.

- 5 7) A method for producing an abrasive carbon foam comprising:
- 10 A) comminuting coal exhibiting a free swell index of between about 3.5 and about 5.0 to a small particle size to form a particulate coal;
- 15 B) blending said particulate coal with from about 1 to about 10% by volume of a carbide precursor to form a reactive blend;
- C) heating said reactive blend in a mold under a non-oxidizing atmosphere to a temperature of between about 300° C and about 600° C and soaking at this temperature for a period of from about 10 minutes to about 12 hours to form a green foam blend;
- 20 D) carbonizing said green foam blend to form a carbonized foam by heating to a temperature of between about 600°C and about 1600°C in an inert atmosphere and holding at said temperature for a period of from about 1 to about 3 hours to form a carbonized foam; and
- E) graphitizing said carbonized foam by heating said carbonized foam to a temperature of between about

**1700°C and about 3000°C in an inert atmosphere and
holding at said temperature for a period of less than
about one hour to form said abrasive carbon foam.**

- 5 8) The method of claim 7 wherein said carbide precursor comprises a
member selected from the group consisting of materials capable of
reacting with carbon to form carbides under carbon calcining and
graphitizing conditions.**
- 10 9) The method of claim 8 wherein said carbide precursor is selected from
the group consisting of: tungsten, silicon and titanium.**
- 15 10) The method of claim 8 wherein said carbon precursor powder is of a
particle size below about 100 microns.**
- 11) The method of claim 7 wherein said particulate coal exhibits a free
swell index of between about 3.75 and about 4.5.**
- 12) An abrasive carbon foam manufactured by a process comprising:**
- 20 A) comminuting coal exhibiting a free swell index of between
about 3.5 and about 5.0 to a small particle size to form a
particulate coal;**

B) blending said particulate coal with from about 1 to about 10% by volume of a carbide precursor to form a reactive blend;

C) heating said reactive blend in a mold under a non-oxidizing atmosphere to a temperature of between about 300° C and about 600° C and soaking at this temperature for a period of from about 10 minutes to about 12 hours to form a green foam blend;

D) carbonizing said green foam blend to form a carbonized foam by heating to a temperature of between about 600°C and about 1600°C in an inert atmosphere and holding at said temperature for a period of from about 1 to about 3 hours to form a carbonized foam; and

E) graphitizing said carbonized foam by heating said carbonized foam to a temperature of between about 1700°C and about 3000°C in an inert atmosphere and holding at said temperature for a period of less than about one hour to form said abrasive carbon foam.

13) The abrasive carbon foam of claim 12 wherein said particulate coal exhibits a free swell index of between about 3.75 and about 4.5.

- 13) The abrasive carbon foam of claim 12 wherein said carbide precursor comprises a member selected from the group consisting of materials capable of reacting with carbon to form carbides under carbon calcining and graphitizing conditions.

5

- 14) The abrasive carbon foam of claim 13 wherein said carbide precursor is selected from the group consisting of: tungsten, silicon and titanium.

- 15) The abrasive carbon foam of claim 12 wherein said carbon precursor powder is of a particle size below about 100 microns.

- 16) The abrasive carbon foam of claim 12 which is a semi-crystalline, largely isotropic, porous coal-based product having a density of between about 0.1 and about 0.8 g/cm³.

15

20